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FEDERAL PROTOTYPE OIL SHALE LEASING PROGRAM

TRACTS U-a, & U-b, UTAH

FISH & WILDLIFE ^{HABITAT} MANAGEMENT PLAN

WHITE

RIVER

SHALE

PROJECT



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DEPARTMENT OF INTERIOR RECEIVED MAY 5 - 1975 OFFICE OF THE SECRETARY MISSOURI BASIN REGION DENVER, COLORADO
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United States Department of the Interior

GEOLOGICAL SURVEY
Conservation Division
Area Oil Shale Supervisor's Office
P.O. Box 2939
Grand Junction, Colorado 81501

May 5, 1975

Memorandum

Exploration Plans Only

To: William L. Rogers, Chairman, Oil Shale Environmental
Advisory Panel

From: Acting Area Oil Shale Supervisor

Subject: Utah Fish and Wildlife Management Plan

The subject plan was recently received in the Area Oil Shale Office and sufficient copies have been supplied to your office for distribution to the Panel members if you so desire.

The plan was reviewed in draft form by the U.S. Fish and Wildlife Service, the State and Vernal District Office of the Bureau of Land Management, the Utah Division of Wildlife Resources and personnel of this office. Relevant comments and suggestions were incorporated into the plan.

J W Hager

James W. Hager
Acting Area Oil Shale Supervisor

8956.496.

May, 1975

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FISH AND WILDLIFE MANAGEMENT PLAN

I. INTRODUCTION

The Oil Shale Lease Environmental Stipulations for Federal Oil Shale Prototype Leasing Program Tracts U-a and U-b, Utah state:

"The Lessee shall submit for approval by the Mining Supervisor, as part of the exploration and mining plan, a detailed fish and wildlife management plan which shall include the steps which the Lessee shall take to: (1) minimize damage to fish and wildlife habitat, including water supplies; (2) restore such habitat in the event it is unavoidably destroyed or damaged; (3) provide alternate habitats; and (4) provide controlled access to the public for the enjoyment of the wildlife resources on such lands as may be mutually agreed upon. The plan shall include, but not be limited to, detailed information on activities, time schedule, performance standards, proposed accomplishments, and ways and means of avoiding or minimizing environmental impacts on fish and wildlife."

The proposed Wildlife and Grazing Guidelines of the Oil Shale Environmental Advisory Panel state:

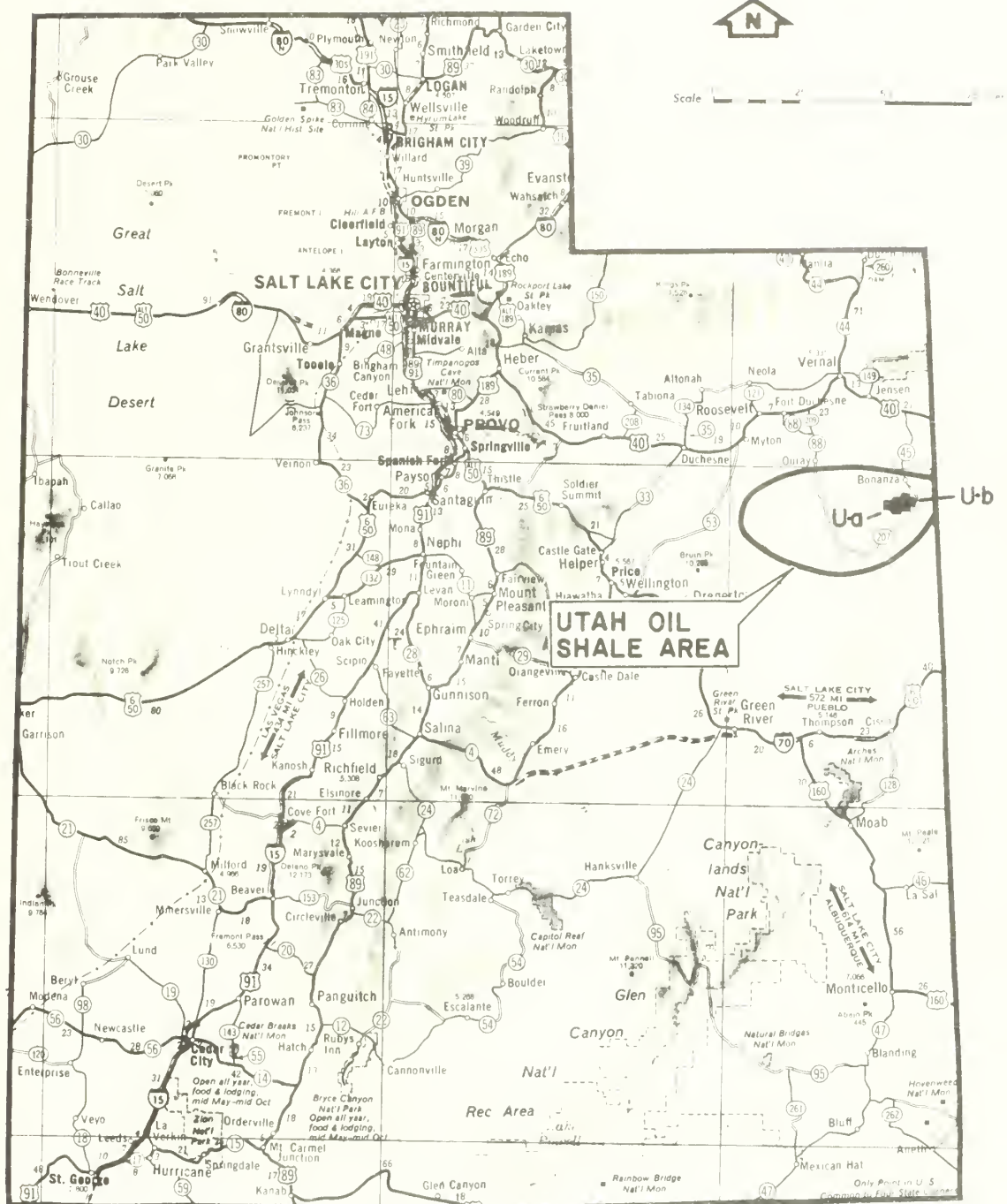
"In planning for wildlife, we believe the Lessee must consider habitat requirements of all species, but some species will be emphasized more than others, must make plans compatible with the area as a whole, must integrate and coordinate with existing and proposed plans of local, state, and federal agencies, must base plans on factual information and not implement until baseline evaluation procedures are established. Wildlife management objectives are reached by manipulating habitats, wildlife populations and people. Protecting habitats is the method of manipulating when no clear and reasonable means of improving are known."

"The plan should identify opportunities as well as problems, and establish goals and objectives to benefit wildlife as much as possible. It should provide alternatives in accomplishing goals as well as resolving conflicts, and should be used in planning all land use activities."

It should be noted that this Fish and Wildlife Management Plan applies only to the two-year environmental baseline monitoring program; the Fish and Wildlife Management Plan for the mining operation itself will be contained in the Detailed Development Plan (DDP).

II. LOCATION AND GENERAL DESCRIPTION

Tracts U-a and U-b of the Federal Oil Shale Prototype Leasing Program are located adjacent to the White River in Uintah County, Utah, approximately 50 miles southeast of Vernal and approximately five miles south of the town of Bonanza. The tracts lie near the center of the Uinta Basin in the major oil shale area (OSA). General tract location is shown in Figure 1. Each tract consists of 5,120 acres of public domain administered by the Department of the Interior. Tract U-a is leased by Sun Oil Company and Phillips Petroleum Company and Tract



LOCATION MAP OF PROJECT AREA
TRACTS U-a, & U-b, UTAH

U-b by White River Shale Oil Corporation for the purpose of mining and processing oil contained in shale deposits lying within or under the leased lands.

Tracts U-a and U-b of the OSA are located in the northeastern part of Game Management Unit 28-A (North Book Cliffs) as defined by the Utah Division of Wildlife Resources (DWR) in Bulletin 67-1, March, 1967 (Figure 2).

III. OBJECTIVES

The purpose of this management plan is to:

1. Minimize the loss of fish and wildlife habitat resulting from monitoring site construction by limiting activities that could disturb the vegetation or soils to the absolute minimum necessary to conduct approved monitoring programs.
2. Develop a rehabilitation program that will result in establishment of permanent vegetative cover on all areas disturbed by the baseline monitoring program.
3. Maintain the area for maximum recreational use by the public during the baseline monitoring period.

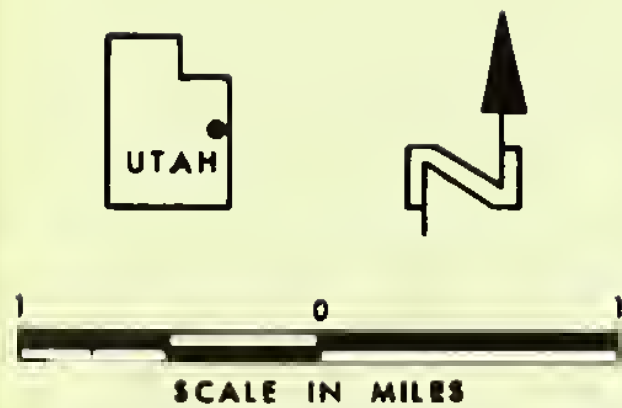
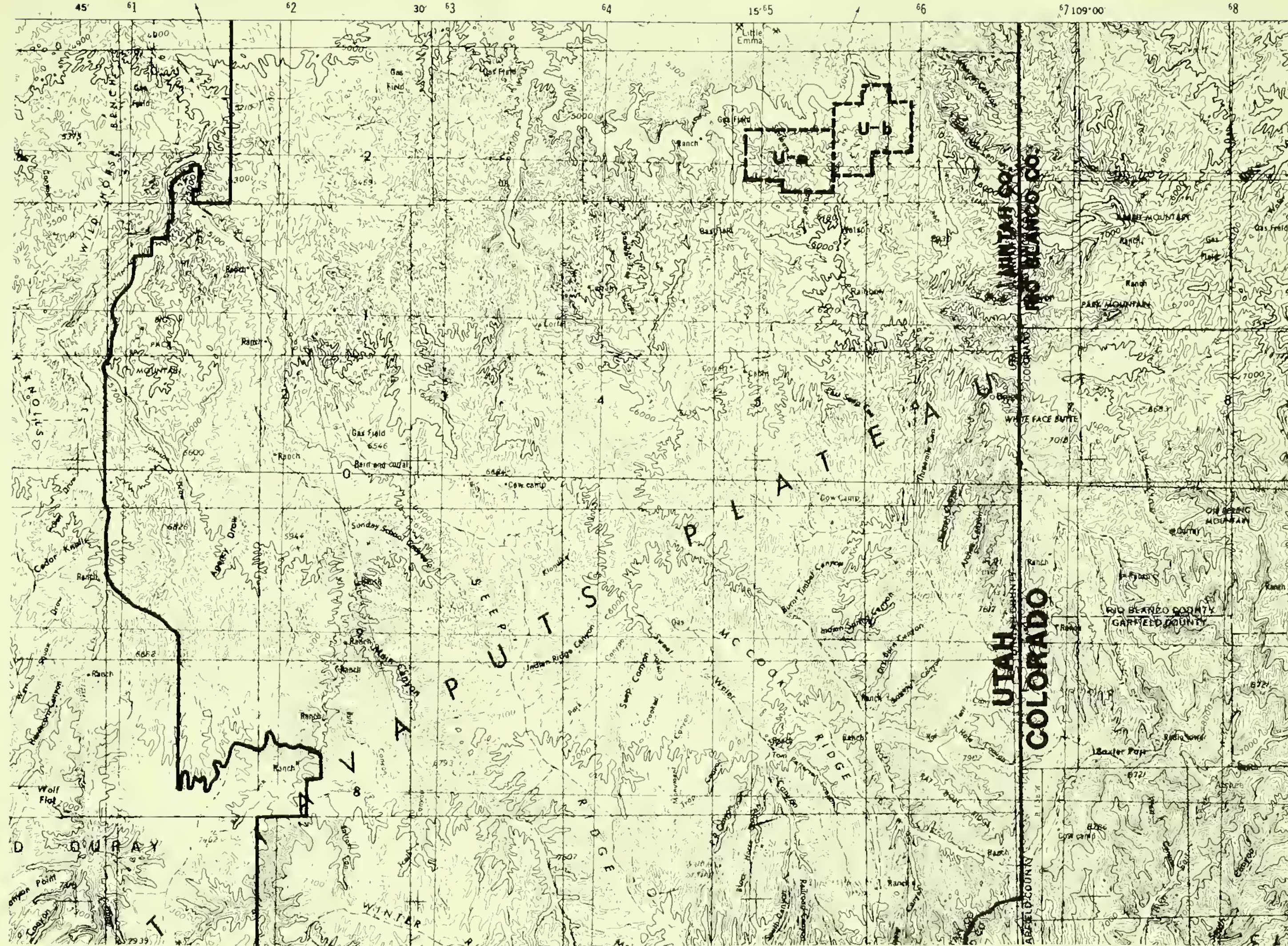
Because relatively little information on the Utah tracts has been collected, analyzed and interpreted, much of the initial plan will necessarily be based on information derived from the experience and observations of personnel from the Vernal district offices of the Utah Division of Wildlife Resources, U.S. Bureau of Land Management and U.S. Fish and Wildlife Service, and data from Olsen, 1973.

As the environmental baseline data collection and monitoring program progresses, quantitative data will be incorporated into the plan. Location of all monitoring sites is shown in Figure 3 (in back pocket).

IV. EXISTING ENVIRONMENT

The area in and around Tracts U-a and U-b is characterized by a semiarid climate and extremely rough topography with sharply dissected canyons, buttes, mesas and badlands, ranging in elevation from 4,800 to nearly 6,300 feet above sea level. The primary watercourse draining the area is the White River, which flows westward through the northern portions of the tracts.

Vegetation is variable depending upon exposure, soil, altitude, water table and other influences, but consists primarily of salt-tolerant desert shrub types at lower elevations; pinyon juniper and sagebrush at higher elevations; and riparian types along the White River. The wide variation in vegetation types and topography results in a correspondingly large diversity in the numbers and location of wildlife on and around the tracts.



GAME MANAGEMENT UNIT 28-A

FIGURE 2

A. Vegetation

The vegetation of Tracts U-a and U-b has been classified into four main types: riparian, juniper-sagebrush, greasewood-sagebrush, and shadscale-sagebrush. Species lists for the four vegetation types are included in Appendix A. These species lists were generated by Dr. Cyrus McKell and personnel from Utah State University, Logan. There is considerable variation within these types. Soil moisture, degree of mechanical and/or grazing disturbance, and site temperature appear to exert primary control over the performance of plant species at the sites studied. Of the soil chemical parameters evaluated, the ratio of monovalent/divalent exchangeable cations exerted the greatest influence on plant response. Although not directly important, soil texture probably has a strong influence on soil/moisture relationships. Mean annual precipitation on the tracts is ten inches or less. There are no known springs or seeps on the tracts.

The riparian vegetation is confined to the floodplains along the White River where there is abundant moisture and deep alluvial soils. In addition to cottonwood, willow and tamarisk trees, this plant community also contains rabbitbrush, greasewood, desert salt grass, alkali sacaton and a number of annuals which form a dense understory. This vegetation type covers about 5 percent of the tracts and provides the highest quality food for herbivores of any vegetation type on the tracts.

The juniper-sagebrush vegetation type is found on a variety of soils and slopes, from steep, rocky breaks to high mesas and from open parks to draws. The soils are shallow at higher elevations and become deeper and less rocky down the slopes in transition to sandy loam in the draws. This vegetation type provides food and cover for many game and non-game species.

Big sagebrush is the most common type of brush found within the juniper-sagebrush type, but black sagebrush is found in nearly pure stands on dryer areas. Desert shrubs such as horsebrush, shadscale and big rabbitbrush are more common close to the White River. Other plants in this vegetation type are brome grass, Indian ricegrass, Russian thistle, halogeton and peppergrass. The juniper-sagebrush community occupies about 40 percent of the tracts.

The greasewood-sagebrush vegetation type is found in the bottom of all major drainages and on valley floors subject to flooding. This type consists of dense stands of tall greasewood with a few other shrubs intermixed and little ground cover. Where water conditions are less than optimal, stands are more open, the growth of greasewood is less vigorous, and other shrubs and grasses are more abundant. Associated plants include shadscale, rabbitbrush, big sage, alkali sacaton, squirrel tail and saltgrass. Forage production for wildlife and livestock is greater in this vegetative type than in the juniper-sagebrush type found on the tracts; however, situations do exist where the availability of sagebrush makes it more important in the pinyon-juniper type. The greasewood-sagebrush vegetation type occupies approximately 25 percent of the tracts.

The shadscale-sagebrush vegetation type is found at low elevations and in areas characterized by extremely xeric conditions. As the clay and salt content of the soil increases, the total plant density and proportion of grasses decreases but the percentage of saltbush increases. The shadscale-sagebrush type occupies approximately 30 percent of the tracts.

B. Wildlife

Definitions of wildlife in this section are taken from the Utah Division of Wildlife Resources Code.

1. Big Game

All species of hooved protected wildlife are classified as big game. Species in this group found on the tracts or within the one-mile perimeter are mule deer, pronghorn antelope, and possibly elk.

2. Small Game

This category includes "any species of protected wildlife normally pursued for sporting purposes which is not classified as big game, aquatic wildlife, or fur bearers." Those found on Tracts U-a and U-b or within the one-mile perimeter around the tracts are:

- Desert cottontail
- Mountain cottontail
- Chukar partridge
- Ducks
- Geese
- Mourning doves
- Mountain lion
- Black bear

3. Non-protected Species

This classification includes all species which are not listed as protected under Utah law. Mammals such as predators and rodents fall into this category. The following is a partial list of more important non-protected species found on the tracts and within the one-mile perimeter:

- Coyote
- Bobcat
- Badger
- Swift fox
- Raccoon
- Ringtail

A check list of mammals (Appendix B) which occur in the OSA was compiled by Olsen (1973) from all known published accounts, records obtained during his field investigations and the observations of professional personnel acquainted with the OSA.

4. *Birds*

Numerous species of birds are commonly found on the site. Within the upland desert shrub community, nesting birds are apparently concentrated in or near the drainage bottoms because of the increased cover provided by larger, more vigorous vegetation. A relatively large number of bird species concentrate in the bottomlands of the White River and Evacuation Creek. Observations by Hayward, et al. (1958) indicate that bird populations are relatively high in the Rainbow area considering the scarcity of water. Similar bird species occur in the Bonanza area, although they are less abundant. A relatively large number of individuals of a few species utilize the drier upland habitats away from the streams.

The only upland game bird known to occur on the tracts is the chukar partridge. Chukar habitat in the area is associated with dense stands of seed-producing annuals that occupy rocky slopes and canyons, especially along streams and wet areas.

The only migratory game bird other than waterfowl found on the tracts is the mourning dove. Doves are found throughout the OSA in all habitat types. These birds utilize the pinyon-juniper type for nesting and rest areas. They frequent dry washes and desert shrub areas containing seed-bearing annuals, which are their primary food source in the area.

Waterfowl habitat in the OSA and especially on Tracts U-a and U-b is limited to segments of the White River. Migrating waterfowl primarily use as resting areas that portion of the White River downstream from the western boundary of the OSA. Waterfowl use of the river may be greater than previously believed. On March 18, 1975, Jeff Grandison of the Utah DWR noted 11 pairs of Canada geese and numerous other waterfowl on the White River between Hells Hole Canyon and Asphalt Wash.

Knowledge of raptor densities in the OSA is limited, but evidence indicates that their numbers are relatively high (Strong, 1973). The abundance of high precipitous cliffs and other rock formations in the OSA provides many perching and nesting sites, as do the cottonwood trees along the White River. Other raptors prefer to use juniper trees and other shrubs for these purposes. In addition, there is an abundance of prey in the form of medium-sized diurnal rodents, small and medium-sized nocturnal rodents and passerine birds. The area is attractive to raptors, especially during the winter months when large numbers migrate into the area.

A checklist of raptors which occur in the area and their status compiled by Mark Strong, BLM, in 1973 and updated by Jim Zumbo, BLM, in 1974 is presented in Table 1.

5. *Amphibians and Reptiles*

The herpetology of the tracts and nearby areas is not well documented. Hayward, et al. (1958) made limited observations and collections in the Bonanza area as part of an overall study of the zoology of the Upper Colorado River Basin. No quantitative data are currently

TABLE 1

Checklist of Raptorial Birds Which Are Known to Occur or Probably Occur in the Utah Oil Shale Area Together With Their Period of Residency and Preferred Nesting Sites.

Species	Status ¹	Preferred Nesting Sites
Turkey vulture	*S	Cliff ledges
Sharp-shinned hawk	*S	Low trees
Cooper's hawk	*S	Trees in river bottoms
Red-tailed hawk	*R	Trees or cliff ledges
Swainson's hawk	*S	Low trees
Rough-legged hawk	W	----
Ferruginous hawk ²	*S	Ground, trees or cliff ledges
Golden eagle	*R	Cliff ledges
Bald eagle	W	----
Marsh hawk	*R	Ground or low vegetation
Osprey	*S	Trees
Prairie falcon	*R-S	Cliff ledges
Peregrine falcon	*R-S	Cliff ledges
Sparrow hawk	*S-R	Natural cavities in trees or cliffs
Great-horned owl	*R	Trees and cliff ledges
Burrowing owl	*S	Burrow in ground

- 1 * - Nests in area
 R - Permanent resident
 S - Summer resident
 W - Winter resident

2 Probably occurs in area

SOURCE: Olson, 1973.

available on the status and distribution of amphibians and reptiles on Tracts U-a and U-b and within the one-mile perimeter around the tracts. A checklist of species which may occur in the area is included in Appendix D.

6. Fish

Fish habitat in the vicinity of Tracts U-a and U-b consists of the White River. Some information is available regarding the kinds and relative abundance of fish in the White River, but data are scanty.

The White River has been given a rating of IV by the Utah DWR. This rating indicates the stream is of poor quality with limited fishery value. However, the White River is the only available fishery near the tracts and, as a result, is of greater importance than the rating indicates.

The highly erodible soils in the White River drainage basin result in heavy siltation and high turbidity. These conditions have created a depleted environment suited primarily to non-game fish, both in the White River and its tributaries in the area of Tracts U-a and U-b.

In addition to providing needed baseline data against which to judge the effects of future activities, fisheries investigations in the White River are needed to determine whether four species of threatened fishes occur in the White River. These species will be discussed in the following section.

During the periods of October 15 to 17 and November 20 to 21, 1974, biologists from VTN, Utah DWR and BLM collected fish from eight different sample points on the White River between Hells Hole Canyon and the confluence with the Green River. Fish were collected from Stations 1-4 on October 15-17, 1974, and from Stations 5-8 on November 20 and 21, 1974. A total of 1,313 fish was collected during the two sampling periods.

Species of fishes and numbers collected from the eight sampling stations are as follows:

Common Name	Scientific Name	No. of Fish
Brown trout	<i>Salmo trutta</i>	1
Carp	<i>Cyprinus carpio</i>	9
Roundtail chub	<i>Gila robusta</i>	28
Fathead minnow	<i>Pimephales promelas</i>	64
Speckled dace	<i>Rhinichthys osculus</i>	160
Red shiner	<i>Notropis lutrensis</i>	855
Bluehead sucker	<i>Catostomus discobolus</i>	22
Flannelmouth sucker	<i>Catostomus latipinnis</i>	153
Channel catfish	<i>Ictalurus punctatus</i>	21
Total		1,313

7. Endangered or Threatened Species

The only bird on the endangered list which may occur in the OSA is the peregrine falcon; however, no detailed data are available on its status or distribution in the area.

Prairie falcons and ospreys are the only threatened birds known to occur in the area. Estimates by Perry (1975) indicate less than 25 pairs of prairie falcons in the OSA. No data are available on ospreys. Studies are currently underway to determine the status and distributions of these birds in the OSA.

There are four threatened species of fishes that potentially could occur in the White River on or near the tracts (Miller, 1972):

- Humpback chub and Colorado squawfish, considered "rare and endangered" (i.e., actively threatened with extinction and continued survival unlikely without special protective measures)
- Humpback sucker, considered "rare" (i.e., not under immediate threat of extinction, but occurring in such small numbers and/or in such a restricted or specialized habitat that it could quickly disappear)
- Bonytail chub, considered "depleted" (i.e., still occurring in numbers adequate for survival, but the species has been heavily depleted and continues to decline at a rate substantially greater than can be sustained)

At the present time, the only mammal in the OSA occupying a unique protected status is the wild horse. These animals are protected by Public Laws 86-234, passed in 1959, and 92-195, passed in 1971. The exact number of wild horses in the OSA and their distribution are not known.

V. EXISTING ACTIVITIES

A. Industrial

The transportation corridor provided by Highway 45 and the gilsonite mining activity in the Rainbow and Little Emma area constitute the primary industrial uses of the OSA. There are also several minor gas and oil fields underlying the tracts and the surrounding area.

B. Agricultural

Three ranches operate on a seasonal basis in the OSA, with a total of 10 to 15 semi-permanent residents. The land surface of the tracts within the OSA is used primarily for livestock grazing and includes three allotments: Hells Hole, Wagon Hound and Southam Canyon.

According to BLM Vernal District personnel, approximately 6,900 sheep graze on portions of the tracts between November and March, which is equivalent to approximately 380

animal unit months (AUMs) of grazing (about 12.5 acres/AUM). In addition, approximately 14,000 sheep trail through the lease area twice each year along the main county road and Southam Canyon Road.

The only cattle grazing allotment on Tracts U-a and U-b includes the riparian area along the White River. One hundred cattle graze for a four-month period in the summer. The majority of their grazing is limited to the river bottom, although they do move onto the sagebrush-grass slopes regularly. Forage utilization in the riparian areas appears to be high, as noted by VTN biologists working in the area in the summer and fall of 1974.

C. Hunting, Trapping and Fishing

The only species of big game in any numbers located on or around Tracts U-a and U-b are mule deer. Most occur in the riparian areas during the summer and are year-round residents of these areas or the adjacent drainages and slopes. Information collected in connection with the large mammal monitoring program will help to quantify the number of deer harvested from the area.

Small game, upland bird and migratory bird hunting is a common seasonal activity in the management area. Small game hunting is limited almost exclusively to cottontail rabbits.

The only upland bird species known to occur on Tracts U-a and U-b is the chukar partridge. Chukar populations vary from year to year in the area (pers. comm., Neilson, 1975). The number of birds harvested corresponds with the annual population.

The number of mourning doves is high during nesting and in the summer, but diminishes with the onset of cold weather. As a result most of the birds have migrated out of the area by the time hunting season opens and the numbers taken are generally low. No data are currently available on the approximate number of doves harvested.

Some predator hunting by sportsmen occurs between November and March. Most predators are taken by professional trappers for economic purposes and by sport hunters. Species commonly taken are coyotes and bobcats.

Trapping of fur-bearers is limited. About one percent of the beaver trapped in Uintah County during the 1973-74 season were taken from the OSA (Beaver Management Unit 43). However, observations by Grandison (pers. comm., 1975) indicate that beaver numbers on the White River are higher than originally believed.

The White River supports few game fish and sport fishing is limited. Contacts will be made with fishermen during the course of the monitoring study to help quantify the fishing pressure and distribution and to help delineate which sport fishes are harvested.

D. Non-Consumptive Recreational

Limited camping occurs during the summer months in the riparian area just north of the Ignatio Stage Station and the White River. Some hiking, sightseeing, exploring, canoeing, river floating and bird watching also occur. One objective of this plan will be to quantify the use of the area for these activities.

In summary, the significant existing uses of the area consist of:

- A transportation corridor through the tracts used primarily by gilsonite mining personnel
- Monitoring activities by the lessee
- Year-long grazing of domestic livestock
- Hunting, trapping and fishing activities, primarily by local residents
- Non-consumptive recreational activities

VI. IMPACTS

As an integral part of the monitoring program, the lessee has constructed a number of air quality and meteorological monitoring stations, surface and ground water quality sampling stations and drilled geologic core holes.

Two air quality and meteorology stations require fenced areas of approximately 700 sq. ft. (65 sq. meters) and each consists of a trailer with a 100-foot tower (30 meters). The other eleven air stations have 30-foot (10-meter) towers and a fenced area that encompass approximately 32 sq. ft. (3 sq. meters). Once drilling is completed at the ground water stations, only a capped pipe appears above the ground. Surface water stations consist of a steel cylinder approximately 3 feet (1 meter) in diameter and 9 to 15 feet high (3 to 5 meters). These stations will be visited frequently during the course of the monitoring program.

The primary impacts which will occur during the two-year monitoring period will be the loss of habitat and disruption of wildlife activities. All activities occurring on the site have the potential to affect habitat and wildlife in varying degrees. Actual and potential impacts that may occur during the baseline monitoring period are as follows:

- Loss of vegetation and habitat from establishment of monitoring stations
- Loss of habitat from road construction to the monitoring stations
- Loss of habitat from power line construction
- Road kills resulting from vehicular travel on the site
- Impacts on wildlife from noise at drill sites which would alter collection of data in those areas
- Loss of habitat from check dam impoundments at drill sites
- Indiscriminate harassment or killing of wildlife.

VII. PLANNED MITIGATIONS

A. General

Monitoring sites have been located to reduce the amount of impact on soils, available browse and cover in the immediate area. To help minimize impacts the following measures have been or will be implemented:

- Road construction will be kept to an absolute minimum
- Temporary roads needed for access to monitoring sites will be closed immediately following cessation of activities
- Drill pad size will be kept to an absolute minimum
- Collection basins will be built to collect water from pump tests should the water quality fail to meet established standards.
- All lessee personnel will confine travel to established roads or access routes

To develop a baseline of data on loss of habitat from these activities and to determine the success of rehabilitation, the lessee has developed a program to record the unit area of habitat affected and the ultimate success of rehabilitation. Detailed data will be kept throughout the life of the project on the following:

- Area lost to road construction
- Area lost to drilling or other activities and not recovered
- Area lost to establishment of monitoring stations
- Extent and status of rehabilitation during and after the monitoring period

The actual net loss of habitat can be determined at any time from the data compiled on area disturbed vs. area rehabilitated. The first phase of this plan was initiated in late November, 1974, when VTN biologists visited all monitoring sites and roads and assessed the amount of vegetation lost and potential impacts on wildlife. Data from these investigations are included in Appendices E and F.

The rehabilitation program will be continuous through the life of the project. This program will attempt to restore all disturbed areas to a productivity level at least equal to that which existed prior to disturbance. To accomplish this objective, fast-growing species will be planted to control erosion in addition to self-sustaining species of vegetation which will become established more slowly on the site.

Methods for rehabilitation of the monitoring sites as planned are:

1. Grade the area to contour and then roughen the surface to increase infiltration and reduce surface run-off. The micro-relief so produced increases soil water availability in the small depressions, creates shaded areas, and reduces wind action in the depressions. This roughening will enhance seedling growth in the boundary layer between soil and air. By manipulating the surface, the survival percentage of plantings will be maximized.

2. Plant prepared surfaces in both early spring and late fall (as these surfaces become available) by drilling and seeding. A mixture of perennial plant species¹ which will ultimately form the final vegetative cover while at the same time furnishing short-term cover will be used. If research provides a better method of planting, such as encapsulated seedlings, it will be used. The objective is to achieve a self-sustaining vegetative cover in the shortest period of time possible.
3. If necessary, reseeded areas will be fenced to protect them from grazing until a stand is established.

The kinds of species to be used will be determined by recognized authorities in the area. The principal components of the seed mixtures to be used will be grasses and forbs, but seedling trees and shrubs will also be planted at appropriate locations on the new surfaces. The rehabilitation plans conform to the stated goals of the federal agencies charged with managing the site. The lessee will plant a variety of species which will allow "multiple use and sustained yield" of the renewable natural resources.

B. Wildlife

Monitoring site activities will be less intensive in the winter, which should reduce stress on the deer caused by the necessity of relocating away from points of significant human activity. Impacts on elk or antelope are not expected to occur because elk are not known to use the area and few antelope occur within the one-mile perimeter north of the White River.

If any impacts affecting any of the species are detected, immediate actions will be taken to minimize or eliminate these impacts. This will include, but not be limited to:

- Timing of activities during the day or season to reduce pressure on the wildlife
- Timing of activities between sites to move personnel to work at the sites during periods of low use by the wildlife

Numerous raptors are in the area at various times of the year, but the greatest numbers occur in the winter. No detailed data are available on numbers, extent of activities or eyrie location. Studies are underway to compile this information. As data become available, on-site activities that conflict with raptors will be put under rigid controls by the lessee to eliminate impacts to those species having very low tolerance to man. The following actions will be implemented if any conflicts develop:

- Complete curtailment of activities near the impact area or timing of activities for a period that would mitigate the problem, i.e., no activities during nesting season
- Timing of activities during the day or night; i.e., no activity in sensitive use areas during the day

¹ Species to be used are currently being determined by AOSS, BLM and USU.

C. Fisheries

The only potential for water pollution that would affect fish or aquatic life would be water from pump tests. Check dams will be built to contain any waters that do not meet established standards.

Should any unforeseen emergency occur which would result in the destruction of large amounts of habitat with the resulting displacement of wildlife (i.e., range fire, water pollution, etc.) the lessee will immediately contact the AOSS and BLM offices in order to receive authority to proceed with control.

D. Human Activity

The increased numbers of people in the area will probably lead to problems. The influx of people associated with testing and monitoring, hunters, fishermen, casual observers and curiosity seekers may result in impacts on the habitat and wildlife to varying degrees.

To minimize impacts on the habitat and fish and wildlife caused by increased numbers of people, the following measures will be taken to control human activities on the site:

- Development of an ongoing education program for all personnel working on the site by June, 1975, to promote awareness of all phases of the monitoring program and personal control measures which will assist the program
- Ongoing seminars in conjunction with the monthly coordination meetings of the BLM, Utah DWR and AOSS to inform personnel of any problems and of changes occurring on the tracts
- Dismissal of any employee convicted of violating any game and fish laws of the State of Utah
- Periodic publications for all employees describing on-site activities, progress of the monitoring program, and possible ways they can assist in improving the program
- A publication to be distributed to visitors identifying the study area and describing activities occurring on the tracts, and how the public can assist in minimizing impacts

This plan is designed to control any new or unique problems that could potentially develop on the site. The potential for discussing problems through education and information will be exploited to the fullest by the lessees during the baseline monitoring period.

The baseline data collected during the two-year study period will be the basis for evaluating future impacts. In addition to minimizing impacts on habitats and wildlife, an effective Fish and Wildlife Management Plan is necessary to maintain existing environmental conditions in order to eliminate bias from subsequent data collection and analysis.

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APPENDICES

APPENDIX A

PRELIMINARY PLANT SPECIES LIST FOR THE SHADSCALE-BLACK SAGEBRUSH TYPE

GRASSES

Western wheatgrass
Agropyron smithii
Bottlebrush squirreltail
Sitanion hystrix
Galleta
Hilaria jamesii
Indian ricegrass
Oryzopsis hymenoides
Needle-and-thread
Stipa comata

FORBS

Aster
Aster species
Eriogonum
Eriogonom species
Fleabane
Erigeron species
Globemallow
Sphaeralcea species
Gray summer cypress
Kochia vestita
Halogeton
Halogeton glomeratus
Hymenoxys
Hymenoxys species
Mountain sagebrush
Artemisia ludoviciana
Mustard
Cruciferae species
Russian thistle
Salsola kali

SHRUBS

Big sagebrush
Artemisia tridentata
Black sagebrush
Artemisia nova

SHRUBS (Continued)

Broom snakeweed

Gutierrezia sarothrae

Cactus

Opuntia spp.

Euphorbia

Euphorbia species

Greasewood

Sarcobatus vermiculatus

Horsebrush

Tetradymia spinosa

Rabbitbrush

Chrysothamnus viscidiflorus

Shadscale

Atriplex confertifolia

Winterfat

Eurotia lanata

**PRELIMINARY SPECIES LIST FOR THE
SAGEBRUSH-GREASEWOOD TYPE**

GRASSES

- Bottlebrush squirreltail
Sitanion hystrix
- Galleta
Hilaria jamesii
- Indian ricegrass
Oryzopsis hymenoides
- Needle-and-thread
Stipa comata
- Sand dropseed
Sporobolus cryptandrus

FORBS

- Broom snakeweed
Gutierrezia sarothrae
- Eriogonum
Eriogonum species
- Fleabane
Erigeron species
- Globemallow
Sphaeralcea species
- Gray summer cypress
Kochia vestita
- Mustard
Cruciferae species
- Russian thistle
Salsola kali
- Western ragweed
Ambrosia psilostachya

SHRUBS

- Big sagebrush
Artemisia tridentata
- Black sagebrush
Artemisia nova
- Cactus
Opuntia species
- Greasewood
Sarcobatus vermiculatus
- Horsebrush
Tetradymia spinosa

SHRUBS (Continued)

Rabbitbrush

Chrysothamnus viscidiflorus

Shadscale

Atriplex confertifolia

Spiny hopsage

Grayia spinosa

Winterfat

Eurotia lanata

PRELIMINARY SPECIES LIST OF THE JUNIPER-SAGEBRUSH TYPE

GRASSES

- Blue grama
Bouteloua gracilis
- Bottlebrush squirreltail
Sitanion hystrix
- Galleta
Hilaria jamesii
- Indian ricegrass
Oryzopsis hymenoides
- Muhly
Muhlenbergia asperifolia
- Mutton bluegrass
Poa fendleriana
- Needle-and-thread
Stipa comata
- Saltgrass
Distichlis spicata
- Sandberg bluegrass
Poa sandbergii
- Western wheatgrass
Agropyron smithii

FORBS

- Aster
Aster species
- Bastard toadflax
Comandra pallida
- Broom snakeweed
Gutierrezia sarothrae
- Cryptantha
Cryptantha species
- Eriogonum
Eriogonum species
- Fleabane
Erigeron species
- Groundsel
Senecio species
- Halogeton
Halogeton glomeratus
- Hymenoxys
Hymenoxys species

FORBS (Continued)

- Mountain sagebrush
Artemisia ludoviciana
- Mustard
Cruciferae species
- Phlox
Phlox species
- Stiff goldenrod
Solidago rigida

SHRUBS

- Big sagebrush
Artemisia tridentata
- Black sagebrush
Artemisia nova
- Cactus
Opuntia species
- Greasebrush
Forsellesia spinescens
- Horsebrush
Tetradymia spinosa
- Green ephedra
Ephedra viridus
- Greenes rabbitbrush
Chrysothamnus greenei
- Euphorbia
Euphorbia species
- Rabbitbrush
Chrysothamnus viscidiflorus
- Shadscale
Atriplex confertifolia
- Tarragon
Artemisia dracunculus

TREES

- Utah juniper
Juniperus osteosperma

PRELIMINARY SPECIES LIST FOR THE RIPARIAN TYPE

GRASSES

- Alkali sacaton
Sporobolus airoides
- Muhly
Muhlenbergia asperifolia
- Mutton bluegrass
Poa fendleriana
- Saltgrass
Distichlis spicata
- Western wheatgrass
Agropyron smithii

GRASSLIKE

- Common reed
Phragmites communis
- Meadow horsetail
Equisetum arvense
- Rush
Juncus balticus

FORBS

- Belvedere summer cypress
Kochia scoparia
- Clematis
Clematis ligusticifolia
- Globemallow
Sphaeralcea species
- Mat sandbur
Cenchrus pauciflorus
- Poverty sumpweed
Iva axillaris
- Russian thistle
Salsola kali
- Thistle
Cirsium species
- Tumble mustard
Sisymbrium altissium
- Western ragweed
Ambrosia psilostachya
- Yellow sweet clover
Melilotus officinalis

THE HISTORY OF THE CITY OF BOSTON

FROM THE FIRST SETTLEMENT
TO THE PRESENT TIME
BY
JOHN H. COLEMAN
OF THE
CITY OF BOSTON

IN TWO VOLUMES.
VOL. I.
FROM THE FIRST SETTLEMENT
TO THE YEAR 1700.

BOSTON:
PUBLISHED BY
JOHN H. COLEMAN,
AT THE
PRESS OF
JOHN H. COLEMAN,
1825.

SHRUBS

Big sagebrush

Artemisia tridentata

Cactus

Opuntia species

Fat-hen saltbush

Atriplex patula

Greasewood

Sarcobatus vermiculatus

Mountain sagebrush

Artemisia ludoviciana

Rabbitbrush

Chrysothamnus nauseosus

Rabbitbrush

Chrysothamnus viscidiflorus

Skunk bush sumac

Rhus trilobata

TREES

Five-stamen tamarisk

Tamarix pentandra

Fremont cottonwood

Populus fremontii

Willow

Salix exigua

APPENDIX B

CHECKLIST OF MAMMALS OF THE OIL SHALE AREA (OSA)

Legend

*A - Confirmed record of occurrence as evidenced by museum specimens or sightings by qualified personnel.

B - Probable occurrence; incomplete or weak evidence.

C - Possible occurrence; probability is of nonoccurrence.

**a - abundant

c - common

o - occasional

r - rare

u - status unknown

Common and Scientific Name	Occurrence in OSA*	Relative Abundance in OSA**
Western pipistrelle <i>Pipistrellus hesperus hesperus</i>	A	c
Big brown bat <i>Eptesicus fuscus pallidus</i>	A	c
Nuttall's cottontail <i>Sylvilagus nuttallii grangeri</i>	A	o
Desert cottontail <i>Sylvilagus audobonii warreni</i>	A	c
Black-tailed jack rabbit <i>Lepus californicus deserticola</i>	A	r
Least chipmunk <i>Eutamias minimus operarius</i>	A	c
Colorado chipmunk <i>Eutamias quadrivittatus hopiensis</i>	A	a
Yellow-bellied Marmot <i>Marmota flaviventris nosophora</i>	A	o
White-tailed antelope squirrel <i>Ammospermophilus leucurus pennipes</i>	A	a
Golden-mantled ground squirrel <i>Spermophilus lateralis lateralis</i>	A	c

Common and Scientific Name	Occurrence in OSA*	Relative Abundance in OSA**
Northern pocket gopher <i>Thomomys talpoides ocus</i>	A	o
Apache pocket mouse <i>Perognathus apache caryi</i>	A	c
Ord's kangaroo rat <i>Dipodomys ordii uintensis</i>	A	c
Beaver <i>Castor canadensis duchesnei</i>	A	o
Western harvest mouse <i>Reithrodontomys megalotis megalotis</i>	A	o
Canyon mouse <i>Peromyscus crinitus auripectus</i>	A	o
Deer mouse <i>Peromyscus maniculatus nebrascensis</i>	A	a
Pinyon mouse <i>Peromyscus truei truei</i>	A	a
Northern grasshopper mouse <i>Onychomys leucogaster pallescens</i>	A	o
Desert wood rat <i>Neotoma lepida sanrafaeli</i>	A	a
Bushy-tailed wood rat <i>Neotoma cinerea macrodon</i>	A	a
Porcupine <i>Erethizon dorsatum couesi</i>	A	o
Coyote <i>Canis latrans lestes</i>	A	c
Swift fox <i>Vulpes velox</i>	A	c
Gray fox <i>Urocyon cinerargenteus scottii</i>	A	c
Badger <i>Taxidea taxus taxus</i>	A	c
Spotted skunk <i>Spilogale putorius gracilis</i>	A	c
Striped skunk <i>Mephitis mephitis</i>	A	o
Bobcat <i>Lynx rufus pallescens</i>	A	c
Mule deer <i>Odocoileus hemionus hemionus</i>	A	c

APPENDIX C

Checklist of Birds Personally Observed by Mark A. Strong on the Utah Prototype Oil Shale Lease Tracts and in Nearby Similar Habitats During 1972 and 1973 (Olsen, 1973: 91-93).

Explanation of Symbols

Abundance	Status
a - abundant	R - permanent resident
c - common	S - summer resident
u - uncommon	W - winter resident
o - occasional	M - migrant
r - rare	* - nests in area

Species	Abundance and Status	Habitat Preference in Oil Shale Area
Canada goose	uR *	White River
Mallard	uR *	White River
Blue-winged teal	oS *	White River
Common goldeneye	oM	White River
Bufflehead	oM	White River
Turkey vulture	uS *	Throughout
Cooper's hawk	oR *	Pinyon-juniper (PJ) and riparian woodland
Red-tailed hawk	cR *	Throughout
Golden eagle	cR *	Throughout
Bald eagle	rM	White River
Marsh hawk	oR *	Throughout
Prairie falcon	rS *	Throughout, nests on cliffs
Sparrow hawk	cS *	Throughout
Chukar	oR *	Rocky slopes and canyons
Sandhill crane	uM	Rests along White River
Killdeer	uR *	Along streams and ponds
Spotted sandpiper	uS *	White River
Least sandpiper	oM	White River
American avocet	uS *	White River
Mourning dove	cS *	Throughout
Great horned owl	oR *	PJ and riparian woodland
Common nighthawk	cS *	Throughout
Vaux's swift	accidental	White River
White-throated swift	uS *	Cliffs along White River
Red-shafted flicker	cR *	PJ and riparian woodland
Yellow-bellied sapsucker	uR *	PJ and riparian woodland
Hairy woodpecker	uR *	PJ and riparian woodland
Downy woodpecker	oR *	PJ and riparian woodland

Species	Abundance and Status	Habitat Preference in Oil Shale Area
Western kingbird	uS*	Riparian woodland
Ash-throated flycatcher	oS*	Riparian woodland
Say's phoebe	cS*	Throughout
Western wood peewee	uS*	PJ and riparian woodland
Horned lark	oR*	Grassland, low desert shrub
Violet-green swallow	uS*	Riparian woodland
Rough-winged swallow	oS*	Stream courses
Barn swallow	uS*	Stream courses
Cliff swallow	cS*	Stream courses
Black-billed magpie	cR*	PJ and riparian woodland
Common raven	uR*	Throughout
Common crow	oR*	Throughout
Pinyon jay	cR*	Pinyon-juniper
Clark's nutcracker	oR*	Pinyon-juniper
Black-capped chickadee	uR*	PJ and riparian woodland
Mountain chickadee	uR*	PJ and riparian woodland
Plain titmouse	oR*	PJ and riparian woodland
White-breasted nuthatch	oR*	PJ and riparian woodland
Red-breasted nuthatch	oR*	Pinyon-juniper
Bewick's wren	oS*	Pinyon-juniper
Rock wren	aS*	Rocky areas throughout
Mockingbird	oS*	Brushland, riparian woodland
Sage thrasher	uS*	Brushland
Robin	uR*	PJ and riparian woodland
Mountain bluebird	aS*	Nests in pinyon-juniper
Townsend's solitaire	oR*	PJ and riparian woodland
Blue-gray gnatcatcher	oS*	PJ and riparian woodland
Loggerhead shrike	uS*	Open brushland
Starling	oR*	Near buildings
Solitary vireo	oS*	PJ and riparian woodland
Virginia's warbler	rS*	Pinyon-juniper
Yellow warbler	cS*	Riparian woodland
Audubon's warbler	cS*	Riparian woodland
Black-throated gray warbler	uS*	Pinyon-juniper
Yellow-breasted chat	oS*	Riparian woodland
House sparrow	oR*	Near buildings
Western meadowlark	uR*	Grassland
Red-winged blackbird	oS*	Ponds and streams
Bullock's oriole	uS*	Riparian woodland
Brewer's blackbird	uR*	PJ and riparian woodland
Brown-headed cowbird	uR*	PJ and riparian woodland
Black-headed grosbeak	oS*	PJ and riparian woodland
Blue grosbeak	rS*	PJ and riparian woodland

Species	Abundance and Status	Habitat Preference in Oil Shale Area
Lazuli bunting	oS*	Brushy slopes and riparian woodland
House finch	uR*	PJ and riparian woodland
Gray-crowned rosy finch	oW	Winters throughout
Black rosy finch	rW	Winters throughout
American goldfinch	oR*	Riparian woodland
Green-tailed towhee	cS*	Brushland throughout
Rufous-sided towhee	cR*	Brushland throughout
Lark bunting	oS*	Grassland
Savannah sparrow	oS*	Grassland
Vesper sparrow	cS*	Open brushland and grassland
Lark sparrow	cS*	Open brushland
Black-throated sparrow	uS*	Brushland
Sage sparrow	cS*	Brushland
Oregon junco	cW	Winters throughout
Gray-headed junco	oS*	Winters throughout
Tree sparrow	oW	Winters throughout
Chipping sparrow	oS*	PJ and riparian woodland
Brewer's sparrow	aS*	Brushland
White-crowned sparrow	uW	Open brushland
Fox sparrow	oM	Woodlands throughout
Song sparrow	oR*	Brushland and woodlands throughout

**Birds Recorded During 50 Three-Minute Observation and Listening Stops Along a 24.5 Mile
Breeding Bird Census Route From the White River South Beyond Rainbow on June 12,
1973. Data Collected by Mark A. Strong**

Species	Number of Individuals	Number of Stops At Which Observed
Common goldeneye	7	1
Turkey vulture	1	1
Red-tailed hawk	1	1
Sparrow hawk	1	1
Mourning dove	14	11
Common nighthawk	16	12
White-throated swift	10	1
Hairy woodpecker	1	1
Say's phoebe	9	8
Western wood peewee	3	3
Horned lark	4	1
Violet-green swallow	2	1
Cliff swallow	1	1
Black-billed magpie	3	2
Common raven	1	1
Pinyon jay	12	10
Mountain chickadee	5	4
White-breasted nuthatch	2	1
Bewick's wren	2	1
Rock wren	43	24
Mockingbird	1	1
Sage thrasher	2	2
Mountain bluebird	9	8
Townsend's solitaire	4	2
Loggerhead shrike	2	2
Starling	12	1
Virginia's warbler	1	1
Yellow warbler	1	1
Audubon's warbler	1	1
Black-throated gray warbler	4	4
Western meadowlark	16	7
Brewer's blackbird	2	1
Brown-headed cowbird	10	5
Lazuli bunting	1	1
House finch	9	5
Green-tailed towhee	1	1
Rufous-sided towhee	3	3

Species	Number of Individuals	Number of Stops At Which Observed
Lark bunting	2	1
Vesper sparrow	3	2
Lark sparrow	5	3
Black-throated sparrow	12	9
Sage sparrow	8	6
Chipping sparrow	3	1
Brewer's sparrow	36	20
TOTAL	288	

APPENDIX D

Checklist of Amphibians and Reptiles Which Probably Occur in the Utah Oil Shale Area Based on Information Provided by Dr. Wilmer W. Tanner, Zoology Department, Brigham Young University in August 1973. Those Marked with an Asterisk are Thought by Dr. Tanner to be the Common and More Abundant Species (Olsen, 1973: 142).

AMPHIBIANS

- Great Basin spadefoot
Scaphiopus hammondi
- * Rocky Mountain toad
Bufo woodhousei
- * Western chorus frog
Pseudacris triseriata
- * Western leopard frog
Rana pipiens

REPTILES

- * Northern plateau lizard
Sceloporus undulatus elongatus
- * Great Basin sagebrush lizard
Sceloporus graciosus graciosus
- * Northern side-blotched lizard
Uta stansburiana uniformis
- Mountain short-horned lizard
Phrynosoma douglassi
- * Northern whiptail
Cnemidophorus tigris septentrionalis
- * Wandering garter snake
Thamnophis elegans vagrans
- * Western blue racer
Coluber constrictor mormon
- Desert striped whipsnake
Masticophis taeniatus
- * Great Basin gopher snake
Pituophis catenifer deserticola
- Plateau night snake
Hypsiglena torquata
- * Rattlesnake
Crotalus viridis

APPENDIX E
POTENTIAL SURFACE DISTURBANCE DUE TO
MONITORING ACTIVITIES

EXPLANATION OF SYMBOLS

- O - Bare ground
- S - Sagebrush
- G - Greasewood
- J - Juniper
- Sh - Shadscale
- R - Riparian
- Sb - Saltbrush
- Br - Grasses
- Rb - Rabbitbrush
- RT - Russian Thistle

AIR AND METEOROLOGY MONITORING SITES

Sites	Vegetative Type	Area Disturbed (Sq. Meters)	Area To Be Rehabilitated (Sq. Meters)	Time To Recover (Years)	Estimated Net Loss (Sq. Meters)
A-1 and Access Road	S-G	250	250	5-8	30
A-2 and Access Road	S-Sb	4,650	4,650	5-8	250
A-3 and Access Road	S-Gr	430	430	5-8	20
A-4 and Access Road	S-Sb	130	130	5-8	10
A-5 and Access Road	R	180	180	5-8	10
A-6	S-Sb	150	150	5-8	15
A-7	S-G	130	130	8-11	10
A-8	S-G	130	130	5-8	10
A-9	S-G	10	10	5-8	0
A-10 and Access Road	R	70	70	2-5	10
A-11	S-Rb	70	70	5-8	10
A-12	G-Rb	160	160	5-8	10

CORE HOLE SITES

Sites	Vegetative Type	Area Disturbed (Sq. Meters)	Area To Be Rehabilitated (Sq. Meters)	Time To Recover (Years)	Estimated Net Loss (Sq. Meters)
X-1	S-G	0	0	5-8	0
X-2	S-G	900	900	5-8	20
X-2 Access Road	S-G	—	All	5-8	0
X-3	S-G	1,400	1,400	5-8	100
X-4	RT	—	All	5-8	0
X-5	S-J	1,200	1,200	5-8	0
X-6	S-Sb	1,600	1,600	10	150
X-8	S-J	900	900	5-10	75
X-9	S-G	1,200	1,200	5-8	80
X-9 Access Road	S-G	6,000	6,000	5-8	500
X-10	S-Gr	1,200	1,200	5-8	80
X-10 Access Road	S-Gr	1,500	1,500	5-8	100
X-11	S-G	1,200	1,200	5-8	70

GROUND WATER MONITORING SITES

Sites	Vegetative Type	Area Disturbed (Sq. Meters)	Area To Be Rehabilitated (Sq. Meters)	Time To Recover (Years)	Estimated Net Loss (Sq. Meters)
G-1	S-G	700	700	5-8	40
G-2	S-G	1,800	1,800	5-8	100
*G-3 & G-21	S	1,500	1,500	-1	75
G-4 & G-15 and Access Road	S-G	1,400	1,400	5-8	50
*G-S	RT	—	—	1	0
G-6 & G-19	S-G	3,000	3,000	5-8	150
G-7	S-J	1,200	1,200	5-8	100
G-8 & G-9	RT	3,000	3,000	1	200
G-10	J-Sb	1,600	1,600	1-3	100
G-11 & G-22	S-G	2,000	2,000	5-8	100
G-12	S-G	500	0	0	500
G-13 & G-20	R	1,600	1,600	5-10	0
G-16	R	500	500	5-10	30
G-14 & G-18	R	1,600	1,600	5-10	150
G-17	S-G	0	0	0	0

* Existing Disturbed Area.

PILOT TEST SITES

Sites	Vegetative Type	Area Disturbed (Sq. Meters)	Area To Be Rehabilitated (Sq. Meters)	Time To Recover (Years)	Estimated Net Loss (Sq. Meters)
P-1	S-G	10,000	10,000	5-8	Unknown
P-2	S-G	10,000	10,000	5-8	Unknown
P-3	S	10,000	10,000	5-8	Unknown
P-4	S-Sb	9,000	9,000	5-8	Unknown

SURFACE WATER MONITORING SITES

Sites	Vegetative Type	Area Disturbed (Sq. Meters)	Area To Be Rehabilitated (Sq. Meters)	Time To Recover (Years)	Estimated Net Loss (Sq. Meters)
S-1	O	0	0	0	0
S-2	O	0	0	0	0
S-2 Access Road	S-G	600	600	5-8	20
S-3	R	20	20	2-5	0
S-3 Access Road	R	15	15	2-5	3
S-4	R	50	50	2-3	0
S-5	R	0	0	0	0
S-5 Access Road	O	0	0	0	0
S-6	R	2	2	2-3	0
S-7	R	3	3	2-3	0
S-7	R & S-G	750	750	5-8	40
S-8	S-G	30	30	2-5	4
S-8 Access Road	O	0	0	0	0
S-9	R	4	4	5-8	0
S-9 Access Road	O	0	0	0	0
S-10	O	0	0	0	0
S-10 Access Road	O	0	0	0	0
S-11	R	0	0	0	0
S-11 Access Road	R	600	600	5-8	20
S-11 Cable Way	R	100	100	5-8	5
S-12	S-G	30	30	5-8	0
S-13	R	30	30	5-8	0
S-15	S-G	10	10	5-8	0
S-15	S-G	900	900	5-8	20

APPENDIX F

ASSESSMENT OF WILDLIFE IMPACTS RELATED TO FIELD MONITORING SITES, TRACTS U-a AND U-b

INTRODUCTION

The monitoring program by necessity involves the removal of some vegetation and animal habitat due to construction of monitoring sites and access roads. From observations of abandoned drill holes and their dates of drilling, rehabilitation of the disturbed areas will take five to eight years. As long as the sites remain barren, they will be avoided by wildlife. This statement is based on the premise that wildlife will avoid an area frequented by people and which provides no cover or primary production. The extent of these impacts varies, of course, with the amount of vegetation removed. The degree and nature of the impacts on wildlife are discussed below.

IMPACTS

Surface Water Stations (S-1 through S-15)

There are 14 surface water quality monitoring stations. Five of these are located on the White River, four on Evacuation Creek, two on Asphalt Wash, one in Southam Canyon, one in Hells Hole Canyon, and one approximately two miles south and one mile east of Thimble Rock. Direct observations of wildlife at each of these stations are tabulated in the attached matrix.

The extent of the impacts to wildlife of these surface water quality stations is limited to the amount of access road built, since the construction of the stations themselves invariably results in a negligible vegetation loss. The stations are not large enough to affect wildlife. The stations which required road construction were S-1, S-2, S-7, S-11 and S-15. Road lengths vary from a few meters to 300 meters at S-15. The only significant impacts of road construction on wildlife are the vegetation loss and the destruction of rodent and rabbit burrows. Most animal species are mobile enough to avoid construction activity. Any displaced animals are subject to predation, starvation, or exposure if all the existing niches of the surrounding area are already filled. The magnitude of this loss is so small that no disturbance should be experienced in the ecosystem.

Pilot Test Holes (P-1 through P-4)

Construction of the four pilot test hole stations resulted in the greatest vegetation loss on the tracts. As much as three acres were disturbed at each station. The wildlife species which may be affected are tabulated in the attached matrix. The extent of wildlife impact will be similar to that resulting from construction of access roads to the surface water quality stations (described above). Another comparative measure of the probable wildlife loss at each site can be made from the percent of vegetal cover removed. Greater cover in a given vegetation type up to a certain maximum supports higher numbers of wildlife.

Ground Water Stations (*G-1 through G-22*)

Construction of the ground water stations affected those wildlife species tabulated in the attached matrix. The impacts are similar to those associated with the pilot test holes. Impacts should not be as great, since the vegetation removal involves only half the area of the pilot test holes.

Exploration Core Holes (*X-1 through X-11*)

Wildlife species affected by these drilling operations are tabulated in the attached matrix. The impacts are the same as those described for the ground water stations but with about half the magnitude of the pilot test hole site impacts.

Air Quality Monitoring Stations (*A-1 through A-12*)

There are four types of air quality-meteorology stations. The vegetation removal in most instances was less than that required for ground water stations. The wildlife species which are found around each proposed station are tabulated on the attached matrix. Because the towers associated with stations are metal, they are avoided by raptors, which show a decided preference for wood. The wood pole power distribution lines leading to the air stations are designed and constructed in accordance with REA Bulletin 61-10 (Powerline Contacts by Eagles and other Large Birds) or guidelines superseding it.

MONITORING STATIONS

[illegible]

MONITORING STATIONS

	G-1	G-2	G-3	G-4	G-5	G-6	G-7	G-8	G-9	G-10	G-11	G-12	G-13	G-14	G-15	G-16	G-17	G-18	G-19	G-20	G-21	G-22
Amphibians																						
Leopard Frog																						
Woodhouse's Toad																						
Reptiles							X			X	X		X			X		X		X		X
Northern Plateau Lizard		X	X											X								
Great Basin Sagebrush Lizard																						
Northern Side Blotched Lizard																						
Mountain Short-Horned Lizard																						
Northern Whiptail																						
Wandering Garter Snake																						
Western Blue Racer																						
Desert Striped Whipsnake																						
Gopher Snake																						
Birds																						
Mourning Dove																						
Oregon Junco													X	X				X				
Dickcissel													X	X				X		X		
Rockwren			X																			
Sparrows				X									X	X				X				
Bluebird						X													X			
Mammals																						
Fox	X					X				X	X						X		X		X	X
Woodrats	X	X						X		X	X						X				X	X
Ground Squirrels	X	X	X	X	X	X			X	X	X						X	X	X		X	X
Deer Mice	X	X	X		X				X	X	X	X					X	X				
Rabbits	X		X										X	X			X	X				
Raccoon																						
Bobcat																						
Deer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sheep		X																				
Cattle																						
Horse																						
Invertebrates																						
Ants		X																				
Spiders												X						X				

MONITORING STATIONS

X-1 X-2 X-3 X-4 X-5 X-6 X-8 X-9 X-10 X-11 A-1 A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9 A-10 A-11 A-12

Amphibians

Leopard Frog
Woodhouse's Toad

Reptiles

Northern Plateau Lizard
Great Basin Sagebrush Lizard
Northern Side Blotched Lizard
Mountain Short-Horned Lizard
Northern Whiptail
Wandering Garter Snake
Western Blue Racer
Desert Striped Whipsnake
Gopher Snake

Birds

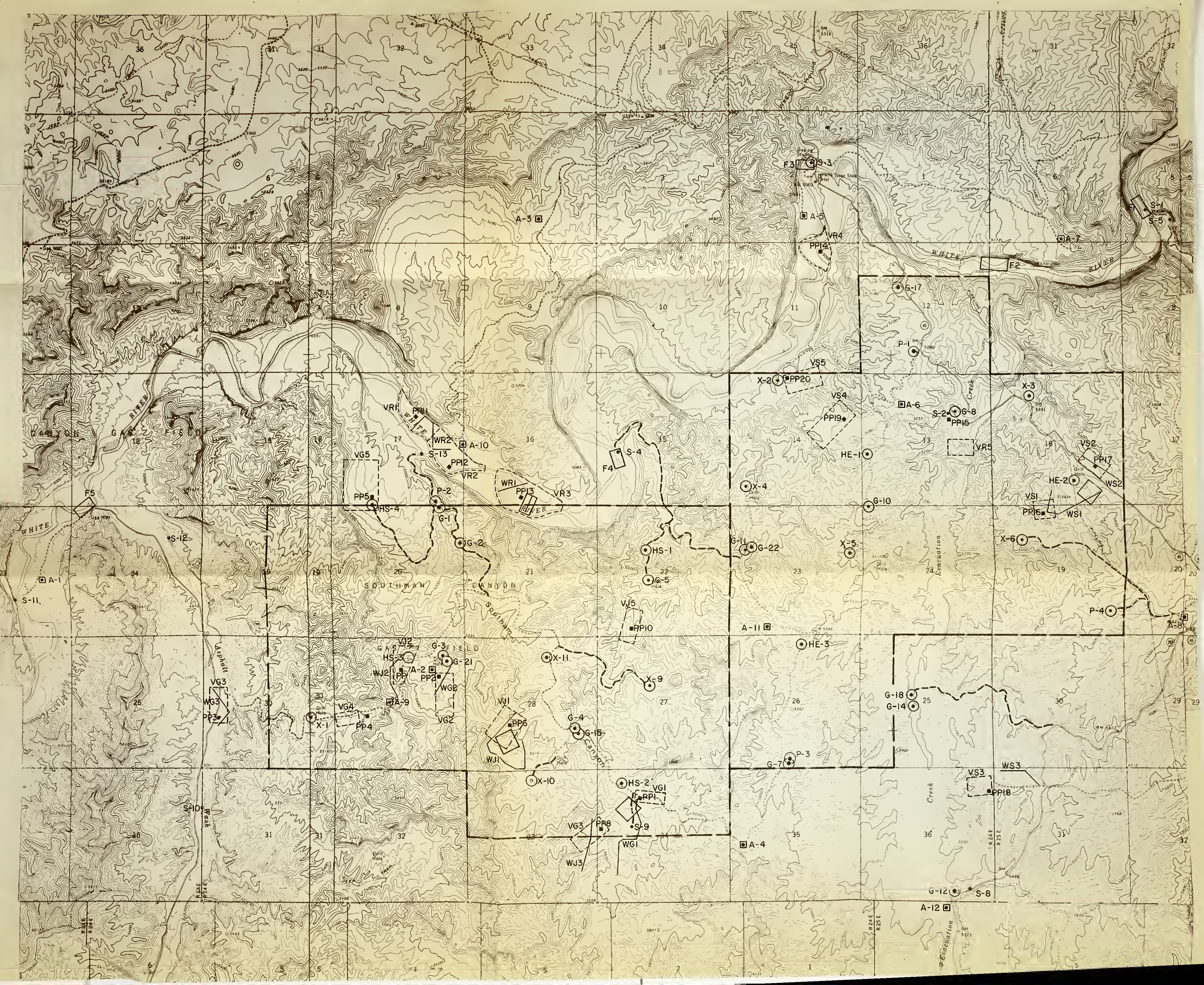
Mourning Dove
Oregon Junco
Dickcissel
Rockwren
Sparrows
Bluebirds

Mammals

Fox
Woodrats
Ground Squirrels
Deer Mice
Rabbits
Raccoon
Bobcat
Deer
Sheep
Cattle
Horse

Invertebrates

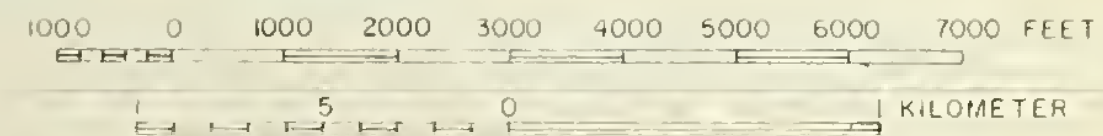
Ants
Spiders



LEGEND

- ACCESS ROUTE
- A AIR MONITORING SITE (12)
 (2,6) COMPLETE AIR QUALITY & METEOROLOGY STATION WITH 100' TOWER
 (3) COMPLETE AIR QUALITY & PARTIAL METEOROLOGY STATION
 (1,4,5,7,8) PARTIAL AIR QUALITY & PARTIAL METEOROLOGY STATION
 (9,10,11,12) PARTIAL METEOROLOGY STATION
- S SURFACE WATER MONITORING STATION (14)
 ○ P PILOT TEST HOLE (4)
 ○ G GROUND-WATER MONITORING STATION (21)
 ○ HE EXISTING GEOLOGIC CORE HOLE, EVACUATION (3)
 ○ HS EXISTING GEOLOGIC CORE HOLE, SOUTHAM (4)
 ○ X EXPLORATION GEOLOGIC CORE HOLE (9)
 — W WILDLIFE SAMPLING AREA (12)
 □ IV VEGETATION STUDY AREA (20)
 G GREASEWOOD
 J JUNIPER
 R RIPARIAN
 S SALT BUSH
- PP PHOTO PLOT (20)
 □ F AQUATIC BIOLOGY SAMPLING STATION (5)

FIGURE 3



REVISIONS		vtm colorado inc ENGINEERS ARCHITECTS PLANNERS 6675 EAST EVANS AVENUE DENVER, COLORADO 80222 (303) 759-4271	
DATE	BY	SUN OIL COMPANY, PHILLIPS PETROLEUM COMPANY AND THE WHITE RIVER SHALE OIL COMPANY FIELD MONITORING SITES EASTERN UTAH BASIN, UTAH	
DATE	BY		
DATE	BY		
DATE	BY		
DATE	BY		
DES BY:	CHK BY:	SCALE:	1" = 2000'
OWN BY: W.C.H.	DATE: 9-6-74	JOB NO.	1517-32



Form 1279-3
(June 1984)

BORROWER'S C

DATE LOANED	BORROWER

USDI - BLM

